tising of the social conscience. We hope to see a continuation of these valuable essays in scientific synthesis, and we would take this opportunity of wishing the author success in his disinterested editorship of *Scientia*, which is an indubitable factor towards true pacifism.

MATHEMATICAL BOOKS.

(1) *Theory of Maxima and Minima.* By Prof. Harris Hancock. Pp. xiv+193. (Boston (Mass.), London, etc.: Ginn and Co., 1917.) Price 10*s.* 6*d.* net.

(2) *Analytic Geometry and Calculus.* By Profs. F. S. Woods and F. H. Bailey. Pp. xi+516. (Boston (Mass.), London, etc.: Ginn and Co., 1917.) Price 10*s.* 6*d.* net.

(1) THE theory of maxima and minima contains pitfalls into which have fallen such well-known mathematicians as Lagrange, Bertrand, Serret, and Todhunter. A peculiar interest, therefore, is attached to the subject, and the reader will find Prof. Hancock's book well worth his study. Except that there is no reference to calculus of variations, the author has succeeded in covering the ground fairly thoroughly, and that without allowing the argument to be anywhere tedious. He gives many references, and a few quite interesting examples.

After a short investigation of maxima and minima of functions of a single variable, he gives in some detail the methods of Scheeffer and von Dantscher, which introduced rigour into the discussion of functions of two or three variables. The theory here is intimately connected with the theory of quadratic forms and singularities of higher plane curves. The author seems not to have read such books as Bromwich's "Quadratic Forms," Hilton's "Linear Substitutions," or Muth's "Elementartheilar," which would have enabled him in places to simplify his treatment of quadratic forms. In tracing a plane curve near a singularity, the author should have made use of Newton's diagram. He should also have avoided such a phrase as "cusps of the first and second kind," which implies that the cusps in question are comparable, whereas the latter is a singularity of much higher complexity than the former.

The chapter on relative maxima and minima is especially interesting. The discussion usually given in the text-books is very scanty, and the fuller treatment here given is very welcome. A valuable point is made in §§ 98–107. The usual proof that the maximum triangle inscribed in a given circle is equilateral runs as follows: "If not, suppose ABC to be the greatest triangle. If $AB \neq AC$, let D bisect the arc BAC. Then the triangle $BDC > BAC$, etc." Is this argument admissible? The reader may compare the following reasoning, due to an Italian author: "Unity is the greatest integer. For, if not, suppose n $(\neq 1)$ the greatest. Then $n^2 > n$, etc." The proofs run parallel, but the tacit assumption (a greatest triangle or integer exists) is lawful in one case and not in the other.

(2) This work is a revision and abridgment of the authors' two-volume "Course in Mathematics for Students of Engineering and Applied Science," and is intended to occupy a two years' course for an average college class. The book does not give the impression of being especially suited to the needs of students of applied science, except for the fact that examples are included on finding centre of gravity, centre of pressure, and so on. In the main the book is apparently simply a course on pure mathematics designed for the American undergraduate. As such it may be commended as quite clear and readable, and it is furnished with some 2000 well-chosen examples. Naturally it is possible to criticise certain portions on the ground of absence of rigidity. But probably the authors have hit the happy mean between a slovenliness which demoralises the beginner and a precision which terrifies him.

It is interesting to contrast the American and English ideas of a suitable syllabus for the first two years of a "pass" mathematical course. The Americans include the co-ordinate geometry of straight line and plane; but the rest of the syllabus consists almost entirely of the calculus and elementary differential equations. Even the circle and conic receive no more than a passing mention; and very little algebra is inserted, such subjects as determinants and the theory of equations being deferred for subsequent study. Contrast this with a certain English B.A. course, which demands no calculus whatever, but requires the "simple properties of conic sections, including a discussion of the general equation of the second degree and the methods of projection"! The book under review may give the student a somewhat false idea of the importance of the conic (it is mentioned casually along with the witch, the cissoid, and the strophoid), and he may find partial differentiation studied by means of three-dimensional co-ordinate geometry a little too hard for him. But, nevertheless, English teachers have very much to learn from their allies. H. H.

OUR BOOKSHELF.

The Botany of Iceland. Edited by Dr. L. Kolderup Rosenvinge and Dr. Eug. Warming. Part ii. 3. Ernst Østrup: "Marine Diatoms from the Coasts of Iceland." 4. Aug. Hesselbo: "The Bryophyta of Iceland." Pp. 348–675. (Copenhagen: J. Frimodt; London: J. Wheldon and Co., 1918.) Price 11*s.* net.

THIS part completes vol. i. of "The Botany of Iceland," the first part of which was issued in two sections, one on "The Marine Algal Vegetation," by H. Jónsson, in 1912, and a second on "The Physical Geography of the Island," in 1914.

The list of marine diatoms from the coasts of Iceland comprises 209 species and varieties; seven species and a number of varieties are here described as new. Mr. Østrup gives a tabular list showing the universal distribution of the forms, as well as their distribution on the different parts of the coasts of Iceland from which it

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appears that this coastal flora has a predominant European character, but that about one-half of the European species may also occur in colder seas; and, further, that diatom-life is most abundant on the south-west coast. The author also gives a synopsis showing the association of the genera and species of diatoms with the various genera of seaweeds.

The greater part of the book (p. 395 to the end) is occupied with a detailed study of the moss flora of the island, based mainly on Mr. Hesselbo's own collections and investigations. This comprises a systematic list with full notes on the distribution of the species mentioned, and including ninety-three liverworts, twenty sphagna, and 326 true mosses. A full account of the Bryophyte communities follows; first the lowland formations, and secondly the vegetation of mountain heights. Mosses play a very important part in the plant-covering of Iceland, occurring either as an essential component of practically all the plant associations, and often in far greater numbers as regards species and individuals than do the higher plants; or as distinct Bryophyte associations from which other plants are entirely absent, or in which they occur only as a subordinate component. The lowland formations are classified as littoral, hydrophilous or wet-soil, mesophilous, xerophilous (heaths), the vegetation of the rocks, and the vegetation of the lava-fields. The hydrophilous afford the greatest variety, the formations varying with the character of the water or soil; especially interesting are those of the hot springs, which the author describes in some detail. A number of successful photographic reproductions illustrate the prominence of the mosses in the Iceland flora.

The Main Currents of Zoology. By Prof. W. A. Locy. Pp. vii + 216. (New York: Henry Holt and Co., 1918.)

THE aim of this book is to explain to the student and to the general reader what have been the main movements in the development of zoology. In the nineteenth century, with which the author begins, the outstanding biological advances were the discovery of protoplasm, the formulation of the cell-theory, the establishment of the doctrine of evolution, the rise of bacteriology, and the beginning of the experimental study of heredity. After interesting chapters on taxonomy and Linnæus, on comparative anatomy and Cuvier, on embryology and von Baer, on physiology and Claude Bernard, the author indicates what seem to him to be the five chief pathways—structural zoology, systematic zoology, general physiology, experimental zoology, and philosophical zoology. This does not seem very satisfactory, for "systematic zoology" is taken to include classification (which belongs to morphology), ecology and study of habits (which belong to physiology); and "experimental zoology" is, as Prof. Locy says, "more a method of general application than a subdivision."

A chapter on insects illustrates a very characteristic modern current, the study of the carriers of important disease-producing organisms, such as those causing malaria and sleeping sickness. Then follows a terse but very clear exposition of theories of evolution. A chapter is devoted to a consideration of the discoveries leading to vaccination and to the use of anæsthetics, with emphasis on W. T. G. Morton's work (1846) in connection with ether. "The ten foremost men of zoological history" are (after Aristotle) Harvey, Malpighi, Linnæus, Cuvier, von Baer, Johannes Müller, Pasteur, Darwin, Max Schultze, and Mendel. The study ends with an estimate of the contributions to zoology made by different nations, and with an emphasis on the international character of science.

There is a copious, well-arranged bibliography, and students will also welcome the series of photographs of great zoologists. Prof. Locy is beyond question right that the educational value of a science is greatly enhanced if the historical setting is made clear, and towards that end his book will be found thoroughly effective.

J. A. T.

A Primer of Engineering Science. By E. S. Andrews. Part i., "First Steps in Applied Mechanics." Part ii., "First Steps in Heat and Heat Engines." Pp. ix + 95 + 67. (London: James Selwyn and Co., 1918.) Price 3*s*. 9*d*. net.

BOTH parts of this book are bound in one volume. Part i. contains chapters dealing with forces, moments, work, power, energy, machines, various types of mechanism, friction, stress and strain. The matter in this part is taken from the author's "Introduction to Applied Mechanics," which was reviewed in NATURE of January 20, 1916. The experimental work described in this part is weak. Six experiments in all are described; the first three only are numbered. Judging from the use made of spring balances in two of the experiments, these appliances have no weight. Part ii. is new, and consists of five chapters dealing with types of heat engines, measurement of heat energy, properties of steam, expansion, indicator diagrams, and the transmission of heat. There are a summary of the contents at the end of each chapter, and also some exercises to be worked by the student. Ten experiments are described in this part. No table of the properties of steam is given; a graph is included, but stops at 100 lb. per square inch; since it is reproduced to a small scale, accurate readings cannot be taken from it. There is evidence of haste in the compilation. On p. 2 the piston ring is described as a "junk" ring; Fig. 6 (*c*) on p. 9 is wrongly arranged; it is stated on p. 39 that Boyle discovered his law in 1862; on p. 50 a diagram traced by an indicator is described as "a diagram of resultant force or effort upon a body." Some of the diagrams are badly reproduced, this being owing to the quality of paper used. Considering the book as a whole, the young student will find some parts interesting and helpful; other parts are treated unsuitably, and a considerable amount of supplementary matter will have to be supplied by his teacher.

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